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EXAMINER	
TORRES, JOSE	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/696,472	KIM ET AL.
	Examiner	Art Unit
	José M. Torres	2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-12,14-17,23,27,33 and 39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-12, 14-17, 23, 27, 33 and 39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Comments

1. The Amendment filed on June 12, 2007 has been entered and made of record.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 4, 9 and 17 are rejected under 35 U.S.C. 102(e) as being anticipated by Aoyama et al. (US 6,535,651).

Re claim 1: Aoyama et al. disclose a method for upscaling image data (Col. 1 lines 7-8), comprising: identifying a gradient value associated with a pixel location of the image data (Col. 25 lines 4-12); determining whether a direction of the gradient value associated with the pixel location is a horizontal direction or a vertical direction (Col. 25 line 58 through Col. 26 line 46); applying a weighted interpolation scheme to a value corresponding to the pixel location, so as to place more weight on

positions closest to the pixel location, when the direction is a horizontal direction or a vertical direction (The weight placed on pixels Sij, S(i+1)j, Si(j+1) and S(i+1)(j+1) is dependant upon the distance *Tx* and *Ty* respectively, placing more weight on positions closest to the original pixel locations, see Formulas 31, 37 and 30, and Col. 30 lines 15-45); and applying a bilinear interpolation scheme or a bicubic interpolation scheme to the value corresponding to the pixel location when the direction is a non-horizontal direction or a non-vertical direction (Formulas 31, 32 and 33, Col. 27 lines 46-59 and Col. 28 line 44 through Col. 29 line 24).

Re claim 4, Aoyama et al. disclose defining a horizontal component of the gradient value ("*Sx*"); and defining a vertical component of the gradient value ("*Sy*"); and calculating a magnitude of the gradient value from the horizontal component and the vertical component ("|Sv|", Col. 37 line 55 through Col. 38 line 56).

Re claim 9: Aoyama et al. disclose the gradient is defined as a two dimensional vector (Col. 37 line 55 through Col. 38 line 56).

Re claim 17: Aoyama et al. disclose a computer readable medium having program instructions for performing the method recited in claim 1 (It should be noted that the apparatus in FIG. 1 represent a computer system which executes the method as recited in claim one, and therefore, it is well

known to a person of ordinary skill in the art that the system comprises a computer readable medium, see claim 1 above and Col. 22 lines 6-29).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 3 and 7, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al. in view of Silver et al. (US 6,408,109). The teachings of Aoyama et al. have been discussed above.

As to claim 3, Aoyama et al. does not explicitly disclose determining a partial derivative associated with the pixel location.

Silver et al. teaches determining a partial derivative associated with the pixel location (Col. 6 lines 1-29).

As to claims 7 and 8, Aoyama et al. does not explicitly disclose defining a partial derivative where a horizontal/vertical direction variable is held constant.

Silver et al. teaches defining a partial derivative where a horizontal/vertical direction variable is held constant (It should be noted that when a derivative is to be found with respect one direction the variable defining the other direction is always held constant. Col. 6 lines 1-29).

As to claim 10, Aoyama et al. does not explicitly disclose transforming coordinates representing the pixel location through a function having a sigmoidal shape.

Silver et al. teaches transforming coordinates representing the pixel location through a function having a sigmoidal shape ("S shaped curve", Col. 16 line 25 through Col. 17 line 8).

Therefore, in view of Silver et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Aoyama et al.'s method by incorporating the method steps of determining a partial derivative wherein a horizontal/vertical variable is held constant associated with the pixel location, calculating a magnitude of the gradient value from horizontal and vertical components, and applying the weighted interpolation scheme using a sigmoidal shaped function in order to provide a method which exploits computationally inexpensive estimates of gradient magnitude and direction to achieve accurate, computationally inexpensive, and fast estimates of edge positions, and providing a high accuracy (Col. 4 line 59 through Col. 5 line 4).

6. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al. in view of Silver et al. as applied to claim 4 above, and further in view of Hsu et al. (US 5,991,464). The teachings of Aoyama et al. modified by Silver et al. have been discussed above.

As to claim 5, Silver et al. further teaches computing a direction angle ("G_θ") associated with the pixel location based upon both the horizontal and the vertical component (Col. 7 lines 31-49); and comparing the magnitude of the gradient value to a threshold value (Col. 13 lines 35-46).

However, Aoyama et al. modified by Silver et al. fails to teach applying the bilinear interpolation scheme or the bicubic interpolation scheme to the value corresponding to the pixel location irrespective of the direction, when the threshold is greater than the magnitude.

Hsu et al. teaches applying the bilinear interpolation scheme or the bicubic interpolation scheme to the value corresponding to the pixel location irrespective of the direction, when the threshold is greater than the magnitude (It should be noted that in both, Silver et al. and Hsu et al., a magnitude comparison is made against a threshold to determine the image portion as containing an edge regarding of the direction, therefore, the comparison made at the classification module in Hsu et al. determines the image portion as oriented or non-oriented, and for non-oriented image portions bilinear interpolation is performed, see Col. 5 lines 7-19 and Col. 7 line 50 through Col. 8 line 10).

Therefore, in view of Hsu et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Aoyama et al. and Silver et al. by incorporating the method step of applying a bilinear interpolation scheme irrespective of the direction, as taught by Hsu et al., when a threshold is greater than a magnitude in order to provide a method for

adaptively enhancing the resolution of a video image while preserving fidelity in a computationally efficient manner (Col. 2 lines 31-43).

As to claim 6, Silver et al. further teaches defining a direction angle relative to a horizontal axis (Col. 7 lines 31-49).

7. Claims 11, 14, 23, 27 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (US 6,037,986) in view of Aoyama et al.

As to claim 11, Zhang et al. teaches a method for scaling video data, comprising: determining whether a block of image data of a current frame is flagged to indicate a level of difference with a corresponding block of image data of a previous frame (Setting $b_N(i,j)=1$ when motion is detected. Col. 6 line 41 through Col. 7 line 62).

However, Zhang et al. does not explicitly disclose applying a weighted interpolation scheme adaptively to each pixel location, so as to place more weight on positions closest to the pixel location, within the block of image data of the current frame based upon a direction associated with the pixel location is a horizontal direction or a vertical direction and the level of difference between the current frame and the previous frame; applying a bilinear interpolation scheme or a bicubic interpolation scheme to the value corresponding to the pixel location when the direction is a non-horizontal direction or a non-vertical direction; and upscaling the block of image data, when the block of image data of the current

frame is flagged to indicate a level of difference with the corresponding block of image data of the previous frame.

Aoyama et al. teaches applying a weighted interpolation scheme adaptively to each pixel location, so as to place more weight on positions closest to the pixel location, within the block of image data of the current frame based upon a direction associated with the pixel location is a horizontal direction or a vertical direction (The weight placed on pixels Sij, S(i+1)j, Si(j+1) and S(i+1)(j+1) is dependant upon the distance *Tx* and *Ty* respectively, placing more weight on positions closest to the original pixel locations, see Formulas 31, 37 and 30, and Col. 30 lines 15-45); applying a bilinear interpolation scheme or a bicubic interpolation scheme to the value corresponding to the pixel location when the direction is a non-horizontal direction or a non-vertical direction (Formulas 31, 32 and 33, Col. 27 lines 46-59 and Col. 28 line 44 through Col. 29 line 24); and upscaling the block of image data (Execution of interpolation schemes).

Therefore, in view of Aoyama et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Zhang et al.'s method by incorporating the method steps of applying a weighted interpolation scheme based upon the direction associated with the pixel location being horizontal or vertical, a bilinear or bicubic interpolation scheme when is a non-horizontal or a non-vertical direction and upscaling the image data, as taught by Aoyama et al. in order to provide an image with good image quality, wherein the edge portions are free from any step-like pattern and are sharp and a flat portion has an appropriate level of sharpness (Col. 4 lines 30-44). Furthermore,

as stated in Zhang et al. any type of motion detection applications may be used (filtering, enhancement, embellishment, etc. Col. 7 line 63 through Col. 8 line 16), thus an interpolation method, such as Aoyama et al.'s, can be implemented using Zhang et al.'s motion detection criteria for images.

As to claim 14, Zhang et al. does not explicitly disclose identifying a gradient value associated with the pixel; defining a horizontal component of the gradient value; defining a vertical component of the gradient value; and calculating a magnitude of the gradient value from the horizontal component and the vertical component.

Aoyama et al. teaches identifying a gradient value associated with the pixel ("Image Density Gradient Vector S_v"); defining a horizontal component of the gradient value ("*Sx*"); defining a vertical component of the gradient value ("*Sy*"); and calculating a magnitude of the gradient value from the horizontal component and the vertical component ("|Sv|", Col. 37 line 55 through Col. 38 line 56).

As to claim 23, performing the method recited in claim 11 using a computer readable medium having program instructions for performing the method is a well known to a person of ordinary skill in the art, therefore, similar to claim 17 above, it is obvious for the reasons stated with respect to claim 11 above.

As to claim 27, Zhang et al. teaches a system for processing block based image data, comprising: an encoder (FIG. 2, "Video Preprocessor **23** and MPEG-2 Compression Circuit **24**") configured to compress video data (Col. 5 lines 22-49), the encoder configured to set a coded block indicator to a first value when inter frame redundancies between corresponding blocks of successive frames of a video stream exceed a threshold value, the encoder further configured to set the coded block indicator to a second value when the inter frame redundancies between successive frames of a video stream are less than or equal to the threshold value (Setting $b_N(i,j)=1$ when motion is detected, and *0* other wise. Col. 6 line 41 through Col. 7 line 62); a decoder configured to decompress the video data (FIG. 2, "MPEG-2 decompression circuit **25**", Col. 5 lines 22-49).

However, as to the scaling module configured to perform the method recited in claim 11, the execution of the flag setting to a value when interframe redundancies are detected, is similar to the indicator explained above. Therefore, the arguments presented with respect to claim 11 above are the same for claim 27.

As to claim 39, using an integrated circuit to perform the method recited in claim 11 is also well known to person of ordinary skill in the art, such as the execution of the method using a computer readable medium. Since Zhang et al. specifies in Col. 5 line 64 through Col. 6 line 23 that the elements can be implemented using Application-Specific Integrated Circuits, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

modify Zhang et al. by Aoyama et al. as stated with respect to claim 11 above in order to provide a system that can be utilized in a number of electronic image processing systems or devices.

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. in view of Aoyama et al. as applied to claim 11 above, and further in view of Margulis et al. (US 6,340,994). The teachings of Zhang et al. modified by Aoyama et al. have been discussed above.

As to claim 12, Zhang et al. modified by Aoyama et al. fails to teach copying upscaled data representing the corresponding block of image data of the previous frame into an upscaled block of image data of the current frame, when the current frame is flagged to indicate a level of redundancy with the corresponding block of image data of the previous frame.

Margulis et al. teaches copying upscaled data representing the corresponding block of image data of the previous frame into an upscaled block of image data of the current frame, when the current frame is flagged to indicate a level of redundancy with the corresponding block of image data of the previous frame (When the group of pixels are the same as the previous group of pixels stored in the buffer memory **240**, the updating of pixels is not performed, therefore, a copy image pixels corresponding to the previous block is performed, wherein the previous block has already been upscaled in the previous steps. Col. 14 line 35 through Col. 15 line 46).

Therefore, in view of Margulis et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Zhang et al. and Aoyama et al. by incorporating the method step of copying upscaled data representing the corresponding of image data of the previous frame into an upscaled block of image data of the current frame, when frame is flagged to indicate a level of redundancy with the corresponding block of image data of the previous frame, as taught by Margulis et al., in order to prevent motion artifacts (Abstract).

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. in view of Aoyama et al. as applied to claim 11 above, and further in view of Silver et al. The teachings of Zhang et al. modified by Aoyama et al. have been discussed above.

As to claim 15, Zhang et al. modified by Aoyama et al. fails to teach transforming coordinates representing a particular pixel location through a function associated with a sigmoidal shape.

Silver et al. teaches transforming coordinates representing a particular pixel location through a function associated with a sigmoidal shape.

Therefore, in view of Silver et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Zhang et al. and Aoyama et al. by incorporating the method step of transforming coordinates representing a particular pixel location through a function associated with a sigmoidal shape, as taught by Silver et al., in order to provide a method

which is computationally inexpensive and provides high accuracy on interpolated edge positions (Col. 4 line 59 through Col. 5 line 4).

10. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. in view of Aoyama et al. as applied to claim 14 above, and further in view of Silver et al. and Hsu et al. The teachings of Zhang et al. modified by Aoyama et al. have been discussed above.

As to claim 16, Zhang et al. modified by Aoyama et al. fails to teach computing a direction angle associated with each pixel location based upon both the horizontal component and the vertical component; and comparing the magnitude of the gradient value to a threshold value, wherein if the threshold value is greater than the magnitude, the method includes, applying a bilinear interpolation scheme or a bicubic interpolation scheme to a value corresponding to the pixel location.

Silver et al. teaches computing a direction angle ("G_θ") associated with each pixel location based upon both the horizontal and the vertical component (Col. 7 lines 31-49); and comparing the magnitude of the gradient value to a threshold value (Col. 13 lines 35-46).

Hsu et al. teaches applying the bilinear interpolation scheme or the bicubic interpolation scheme to the value corresponding to the pixel, when the threshold is greater than the magnitude (Similar to claim 5 above, it should be noted that in both, Silver et al. and Hsu et al., a magnitude comparison is made against a threshold to determine the image portion as containing an edge regarding of the

direction, therefore, the comparison made at the classification module in Hsu et al. determines the image portion as oriented or non-oriented, and for non-oriented image portions bilinear interpolation is performed, see Col. 5 lines 7-19 and Col. 7 line 50 through Col. 8 line 10).

Therefore, in view of Silver et al. and Hsu et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to further modify Margulis et al. and Aoyama et al. by incorporating the method steps of computing a direction angle and a magnitude of the gradient value, and applying a bilinear/bicubic interpolation scheme to a value corresponding to the pixel location when the magnitude is below a threshold value, as taught by Silver et al. and Hsu et al., in order to provide a method which exploits computationally inexpensive estimates of gradient magnitude and direction to achieve high accuracy (Silver et al.'s Col. 4 line 59 through Col. 5 line 4) and provide a method for adaptively enhancing the resolution of a video image while preserving fidelity in a computationally efficient manner (Hsu et al.'s Col. 2 lines 31-43).

11. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al. in view of Ward et al. (US 5,809,182). The teachings of Aoyama et al. have been discussed above.

As to claim 33, Aoyama et al. does not explicitly disclose an integrated circuit capable of performing the method recited in claim 1.

Ward et al. teaches an integrated circuit capable of performing the method recited in claim 1 (It should be noted that similar to claim 17 above, the

implementation of an interpolation process in an integrated circuit would have been obvious to one of ordinary skill in the art at the time the invention was made, since integrated circuits for implementing process are very well known within the art, see Abstract, Col. 2 lines 9-31 and claim 1 above.).

Therefore, in view of Ward et al., it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Aoyama et al.'s method by incorporating it in an integrated circuit, as taught by Ward et al., in order to provide a system that can be utilized in a number of electronic image processing systems or devices, including film or print scanners, image processing accelerators or digital hard copy printers (Col. 11 lines 13-20).

Response to Arguments

Claim Rejections under 35 U.S.C. § 102

12. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections under 35 U.S.C. § 103

13. Applicant's arguments with respect to claim 11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Talluri et al. disclose Color Resolution Enhancement by

Using Color Camera and Methods, Sekine et al. disclose an Image resolution Conversion Method and Apparatus Thereof, and Thurnhofer et al. disclose an Edge-enhanced Image Zooming.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José M. Torres whose telephone number is 571-270-1356. The examiner can normally be reached on Monday thru Friday: 8:00am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571-272-7429. The fax

phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMT
08/21/2007

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SUPERVISORY PATENT EXAMINER